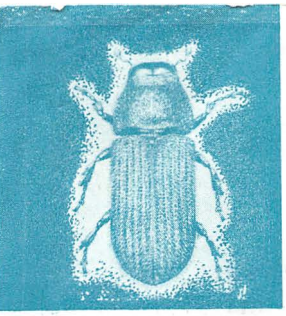

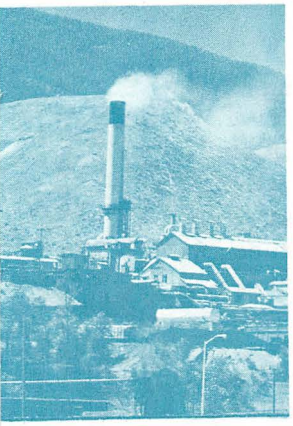
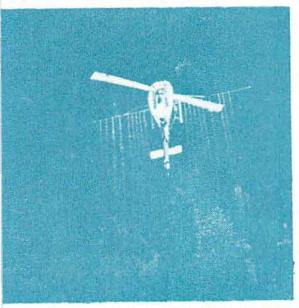
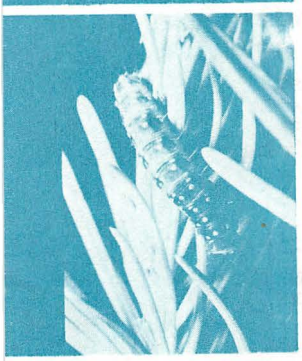
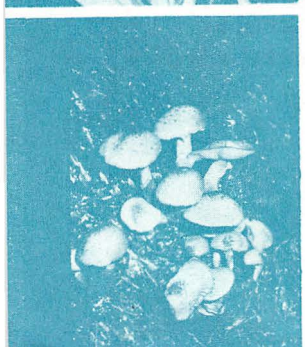

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FOREST ENVIRONMENTAL PROTECTION

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STATUS OF BARK BEETLE POPULATIONS IN WINDTHROW FLATHEAD NATIONAL FOREST MONTANA

1976

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ABSTRACT

Windthrow occurred during late April on the Glacier View, Hungry Horse, Spotted Bear, and Swan Lake Ranger Districts, Flathead National Forest. An evaluation to determine potential for development of spruce beetle and Douglas-fir beetle outbreaks was made during late June and early July. All areas examined were classed as having low or medium potential for outbreak development. Salvage logging is recommended to further reduce outbreak potential.

INTRODUCTION

An evaluation was made to determine the potential for bark beetle buildup in blowdown that resulted from strong winds during the last week of April 1976.

Windthrow occurred in Whale Bench, Whale-Moose, Upper Moose, Red-Moose, Hay, Langford, Wolverine, McGinnis East, Depuy-McGinnis, Kimmerly, and Canyon Creek drainages on the Glacier View Ranger District; in Dudley, Lost Johnny Landing, Wildcat, Felix, Aeneas, Forest, and Biglow drainages, Hungry Horse Ranger District; Quintonkin, Ball, Branch, Posey, and Connor drainages, and the Taylor Loop Road, Spotted Bear Ranger District; and Wild Bill, and Dayton-Ronan Sale, Swan Ranger District (Figure 1).

Windthrow included Douglas-fir, *Pseudotsuga menziesii* var. *glauca;* Engelmann spruce, *Picea engelmannii*; western larch, *Larix occidentalis;* subalpine fir, *Abies lasiocarpa*; white bark pine, *Pinus albicalus*; and western white pine, *Pinus monticola*. Potential for buildup was rated according to Schmid and Frye (1975).

RESULTS AND DISCUSSION

Windthrow occurred from single scattered trees on a few acres to several hundred trees concentrated on 100 acres. Scattered single tree windthrow occurred on ridges and sidehills, and concentrated windthrow was mainly confined to creek bottoms. Diameter of windthrow ranged from 8 to 30+ inches d.b.h.

In areas examined, some spruce was found infested with the following bark beetles: spruce beetle, *Dendroctonus rufipennis*; *Polygraphus* sp. and *Ips* tentatively identified as *Ips perturbatus* and *Ips engelmanni*. Some flatheaded woodborers, *Melanophila* sp., and roundheaded woodborers, probably *Spondylis* sp. were commonly found in downed trees. In most areas, *Ips* spp. and *Polygraphus* infested the top 180° of downed spruce, and galleries contained eggs and larvae, or galleries were still being elongated. Where spruce beetles had infested downed trees, galleries were up to 6 inches long. The majority of downed spruce had not yet been infested with *D. rufipennis*. Heaviest attacks (5-6/ft.^{2}) occurred on larger spruce in more shaded conditions. It appeared that spruce beetle had been infesting down trees for approximately one week, and that the peak attack would occur during the next 2-3 weeks.

Douglas-fir beetle attacks were heavier on larger Douglas-fir in shaded locations. Douglas-fir windthrow on open hillsides such as in the Dayton-Ronan Sale were more lightly infested (2-5 attacks/ft.^{2}).

Spruce beetles infesting windthrow and standing stumps through August will produce broods that will overwinter as larvae the first year (1976-1977). These broods will develop to pupae next summer, then to adults by August 1977. These adults will remain in trees until late June 1978. Beetle emergence will occur in late June and continue through August. Between July 1976 and July 1978, a number of mortality factors will reduce spruce beetle broods to where average number of beetles ft.^{2} may be fewer than the number of attacking parent beetles.

Excessive heat from direct sunlight on bark may be one factor contributing to brood mortality in slash and windthrow (Massey and Wygant 1954); Reid 1957). However, this mortality usually occurs on the top 180° of downed trees. Beetle survival is much higher on the bottom or shaded 180° of downed trees, and here, emerging beetle numbers can exceed number of attacking parents. Extreme cold winter temperatures can cause extensive

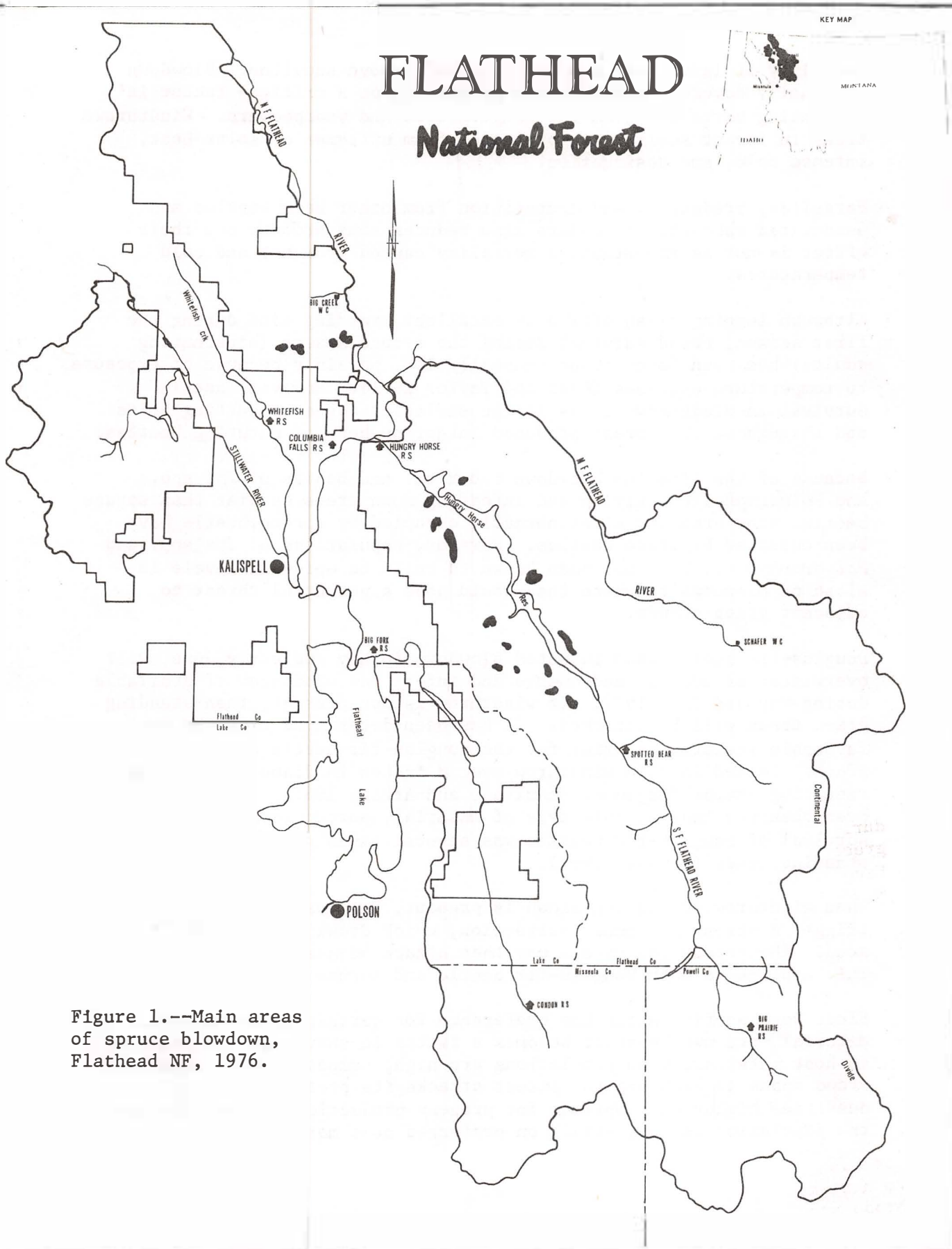

Figure 1.--Main areas of spruce blowdown, Flathead NF, 1976.

mortality of larvae and adults under bark above snowline. Blowdown is usually covered by snow which appears to be a critical factor in preventing mortality from low temperatures and woodpeckers. Windthrown trees in forest shelter are protected from extremes of solar heat, intense cold, and desiccation.

Parasites, predators, and competition from other bark beetles and associated subcortical feeders also reduces some broods; but their effect is not as important as mortality caused from hot and cold temperatures.

Although logging slash offers an excellent breeding site during the first season, brood survival during the second season (hibernating adults) has been found to be unusually low, possibly because of exposure to temperature extremes (Dyar and Taylor 1971). However, beetle survival in windthrown trees at the sheltered edges of cutting units and throughout the forest produced larger numbers of maturing beetles.

Because of the time the blowdown occurred, and habits of *Ips* spp. and *Polygraphus* sp. flying and infesting down trees earlier than spruce beetle, many breeding sites normally occupied by spruce beetle have been occupied by these beetles. However, populations of *Ips* spp. and *Polygraphus* sp. have not been known to build to epidemic levels in slash or blowdown to where they would pose a potential threat to adjacent green stands.

Douglas-fir beetle that infested blowdown in May and early June, will overwinter as adults, and emerge and infest new windthrow if available during May and June 1977. If windthrow is not present, then standing green trees will be attacked. It has been determined that the most favorable breeding material for the Douglas-fir beetle consists of freshly felled logs in windthrow over 8 inches in diameter, and the resulting stumps (Lejeune, McMullen, and Atkins 1961). Also it has been observed that in this type of material, particularly when shaded, survival of Douglas-fir beetles was several times greater than in standing trees (Furniss 1962).

When windthrow or logging slash is present, beetles attack and trigger a strong secondary attraction, which draws more beetles to the area. The population excess may then attack adjacent healthy trees. This applies to both Douglas-fir beetle and spruce beetle.

Since Douglas-fir beetle has preference for certain types of host material, its own behavior becomes a factor in survival. In relation to host material, when populations are high, competition for available brood space is high and the insect attacks its preferred host at densities higher than optimum for progeny production; conversely, when the population is low, attack on preferred host material is dispersed

and the population can increase rapidly, conceivably as much as ten-fold or more in one generation (Atkins and McMullen 1960). This may also apply to spruce beetle populations as both prefer windthrow, slash, and logging debris over standing trees.

When the preferred host material has been reduced, infestations will manifest themselves in standing trees.

In rating stands adjacent to windthrow for potential to spruce beetle outbreaks, factors such as physiographic location, tree diameter, basal area, and percentage of spruce in the canopy were used.

Schmid and Frye (1975) established the following potential outbreak rating:

Stand risk value	Potential outbreak rating
11-12	High
7-9	Medium
4-5	Low

To calculate the rating the following risk categories for potential spruce beetle outbreaks for each stand characteristics were used:

Risk category	I Site index	II Av. diameter of live spruce above 10 in d.b.h.	III Basal area	IV Proportion spruce in canopy
		In. d.b.h.	$Ft.^2$	Percent
High (3)	Spruce on well-drained sites in creek bottoms	16	150	65
Medium (2)	Spruce on sites with site index of 80-120	12-16	100-150	50-65
Low (1)	Spruce on sites with site index of 40 to 80	12	100	50

Based on data taken, ratings for stands adjacent to windthrow were rated as shown in table 1.

Table 1.--Risk rating of stand to establish potential for spruce beetle outbreak, Flathead National Forest, 1976

Location:	Spruce volume down (MBF)	I Site Index	II Av. d.b.h. standing spruce	III Basal Area (ft^2)	IV % spruce in canopy	Stand rating
Swan Lake RD						
Wild Bill	300	65-70 but in well drained bottom	11.3	100	32	1,1,1,1 (4)
Hungry Horse RD						
Lost Johnny	50	60	12	30	20	1,1,1,1 (4)
Wildcat	500	60	30+	125	90	1,3,2,3 (9)
Tent Cr.	145	70	20	100	40	1,3,1,1 (6)
Spotted Bear RD						
Taylor-Loop Rd. (Quintonkon Area)	150-200	70-80	20	60	20-40	1,3,1,1 (5)
Glacier View						
Depuy-McGinnis	354	60-80	21	75-100	50-60	1,3,1,2 (7)
Whale-Moose	658	70	13	75-100	35	1,2,1,1 (5)
McGinnis East	319	70	16	75-100	5	1,2,1,1 (5)
Langford	68	80	13	75-100	15	2,2,1,1 (6)
Red Moose	97	70	13	75-100	30	2,2,1,1 (5)
Wolverine	132	80	14	75-100	30	2,2,1,1 (6)
Kimmerly	170	60-70	18	75-100	50	1,3,1,2 (7)
Upper Moose	70	60-70	15	75-100	40	1,2,1,1 (5)
Whale Bench	310	70	13.5	75-100	60	1,2,1,2 (6)
Canyon Cr.	170	60-90	20	50-95	60	2,3,1,2 (8)

Data shows that most stands were rated with a low potential for a spruce beetle outbreak. Only Canyon Creek, Kimmerly, and Depuy-McGinnis blowdown on the Glacier View District; and Wildcat blowdown on the Hungry Horse District were rated as having medium potential for an outbreak developing.

RECOMMENDATIONS

Based on data collected during evaluation of the blowdown areas, the following is recommended:

1. All areas of concentrated blowdown should be salvage logged within 1 year. This will reduce the potential for standing green trees becoming infested by spruce beetle and Douglas-fir beetle, that may complete a generation in 1 year, fly and infest new host material.

2. Tops should be kept small (under 8 inches in diameter).

3. Concentrated groups of trees with roots intact that cannot be removed this season should be re-examined next year prior to beetle flight to determine potential for outbreak development.

4. Care must be taken that as little mechanical damage as possible occurs to the residual stand. This includes root damage such as that caused by road cuts.

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